

For that reason, many carriers relied on a single manufacturer's infrastructure equipment. This allowed for intersystem coordination within a single operator's cluster of MTSOs. But it did not allow for intersystem coordination between operators using different infrastructure equipment.

11. The TR 45.2 subcommittee recently settled on a uniform technical standard to support intersystem handoff and call delivery. The new standard, known as IS-41, was first promulgated in October 1987 and most recently revised in January 1990. It was adopted unanimously by all the members of the TR 45.2 Subcommittee who voted. IS-41 was six years in the making. It is the only existing TIA standard for intersystem handoff and automatic call delivery, and it may prove to be the only basis for intersystem operations in the United States for the foreseeable future.

12. Switches from different manufacturers conforming to IS-41 will be able to communicate with one another and, thus, disparate systems can be linked together in such a way that a customer in a foreign system can enjoy the same service that the customer would in the customer's home system. Calls can be delivered and handed-off from one MTSO to another regardless of the manufacturers of the infrastructure equipment involved.

Although compliance with IS-41 is not mandatory, its adoption is likely to induce manufacturers to produce equipment in compliance with its terms and, therefore, to have been an important step in the direction of seamless nationwide service. IS-41 fulfills the principal purpose of an industry standard, as articulated in section 6.2 of the TIA Engineering Manual, which is to "promot[e] interchangeability and interoperability of products falling within the scope of TIA Engineering Committees."

Intersystem Handoff

13. Believing that it would be desirable to customers, the TR 45.2 Subcommittee undertook to standardize a process which would enable calls to remain connected when customers roamed from the coverage area of one system to that of another system. For this to happen with respect to any particular call, the call must be handed-off from the MTSO initially handling the call to the MTSO serving the area into which the customer has roamed. This process is extremely difficult to engineer. Handoffs are initiated and coordinated by gauging the strength of the signal from the mobile telephone to nearby cell sites. When the MTSO serving a particular customer detects that the signal from that customer is deteriorating, it asks the cells adjacent to the serving cell to measure the signal strength of the mobile unit. If one or more of these adjacent cells is in a different MTSO, then the neighboring MTSO will also be asked to measure the strength of the signal. The neighboring MTSO will instruct its adjacent cell site(s) to tune to the channel carrying the call and take measurements of signal strength. The neighboring MTSO will then communicate those measurements back to the home MTSO.

14. Based on these measurements, the home MTSO determines which cell can best serve the customer. If the home MTSO determines that the call can best be handled by a cell site in a neighboring system (i.e., that the call should be handed-off), it asks the neighboring MTSO to assign a specific channel for the call and then -- before the quality

of the call significantly deteriorates -- the home MTSO instructs the mobile telephone to switch to the channel to which the neighboring system is now tuned. Simultaneously, the home MTSO identifies a landline trunk over which the call can be extended to the neighboring MTSO, the neighboring MTSO confirms the choice of trunk, and the call is rerouted through the neighboring MTSO to the cell site serving the customer. The call can then continue on the new channel through the cell sites of the neighboring MTSO.

15. Effective call handoff must take place quickly. When a car driving down an expressway moves from one system to another, the first system will typically have only a few seconds to handoff control to the second system; any greater delay will result in unnecessary deterioration of the signal and potentially in the call being dropped. Furthermore, the strength of the signal is affected by many factors, not just proximity.

16. Because of the speed requirements of intersystem handoff, it is not technically practical at this time to handoff calls between MTSOs using switched landline facilities. Only direct connections (dedicated trunks) between MTSOs, with no other intervening switches, are currently envisioned for this process. Indirect connections through the landline network are not. Routing the call via the customer's Presubscribed Interexchange Carrier (PIC) could take several seconds or more. In that time the signal may deteriorate so much as to cause the call to disconnect. Even if the call does not disconnect, the quality of service is likely to be poorer.

17. Setting to one side considerations of speed, routing the call through the public switched telephone network would make no sense from a purely engineering point of view. Intersystem handoff is already tremendously complex. It requires exact timing and a high degree of coordination between MTSO switches. Today, this is most effectively and efficiently accomplished using dedicated trunks.

18. Accordingly, IS-41 assumes the use of dedicated trunks between MTSOs to effectuate call handoff. IS-41 was not designed for transfer of a call through the public switched network. Although it would be technically possible to transfer calls over the customer's PIC if each interexchange carrier provided dedicated trunks between each MTSO, the potential number of trunk groups and splintering of traffic would result in a very inefficient network design. Consequently, IS-41 was not designed for use of the customer's PIC in transferring the call from one MTSO to the other.

Automatic Call Delivery

19. In the most primitive form of call delivery, the person calling the mobile telephone must know beforehand precisely where it is located. The caller dials a roamer access port (this could be a 7 or an 11-digit number), receives a second dial tone, and then dials the mobile telephone's number. The procedure is inconvenient at best, and useless for reaching people who move frequently and unpredictably. It also requires landline callers to keep handy a book with the numbers of all the various roamer access ports. "Follow me" roaming is one step better. The traveling cellular customer checks in by dialing a three-digit code upon entering a new service area. Notice of the customer's arrival is then passed back to the customer's home system, and call forwarding is handled accordingly. The system is still less than convenient; the traveler must check in, and

must also know each time a system is departed from, and another is entered. A third option is wide-area paging, whereby the home MTSO searches for the roaming customer in several MTSOs simultaneously. This has the advantage that the customer does not have to do anything in order to receive calls, but it is inefficient. With every cell site in all the associated systems paging the customer simultaneously in response to every incoming call, the cellular network may become overloaded.

20. The treatment of automatic call delivery under IS-41 was designed to overcome these limitations. Using equipment conforming to IS-41 roaming customers would be able to "register" automatically whenever a unit enters a system. If the newly entered system is not the customer's "home" system, then the "foreign" system's MTSO automatically exchanges information with the home MTSO to arrange for the delivery of calls, assuming the customer has indicated the desire to receive calls. All of this takes place without the customer having to do anything other than turn on the mobile telephone.

21. Whenever a customer's cellular telephone is turned on, it periodically scans for the strongest cell site signal. The cells continually broadcast their system identification ("SID") and the mobile telephone registers if that system's SID differs from the SID detected by the mobile unit during its last scanning cycle (i.e., when the customer moves from one MTSO to another). The mobile telephone then automatically sends to the foreign system's switch its telephone number and its electronic serial number (ESN). The foreign system thus recognizes that a roaming customer is within its boundaries and contacts the home system to request relevant information (e.g., a "profile") about the roaming customer.

22. The customer's profile can indicate, among other things, whether the customer has agreed to accept calls while roaming outside the customer's home system. It can also indicate custom calling features to which the customer has subscribed, such as call forwarding, call waiting, and three-way calling. And it can indicate the customer's PIC, assuming the customer has a PIC.

23. IS-41 contemplates that a customer's profile can be transmitted directly between MTSOs or through an intermediate network. Without this network, a cellular system would have to be directly connected to every other cellular system's switch in the United States in order to provide automatic call delivery on a nationwide basis. With such a network, the number of other MTSOs to which each system must be directly linked is substantially reduced.

24. If the roaming customer's profile indicates a desire to have calls delivered to the customer in a foreign system, the home system is provided with a "routing alias" by the foreign system. A "routing alias" may be a temporary 10-digit number assigned to the roaming customer by the foreign system to allow for the completion of a call to the roaming customer within that system. IS-41 contemplates that the routing alias may be transmitted in one of two ways. The routing alias may either be transmitted when the roaming customer registers in the foreign system or, when the foreign system is notified that a registered roaming customer has a call pending completion. The second alternative is important for a foreign system that wants to conserve the number of temporary

numbers (i.e. "routing alias") that it has available to assign to roaming customers. This could be critical in areas such as the East Coast where numerous Metropolitan Statistical Areas (MSAs) abut, thereby generating extremely high volumes of intersystem traffic and, hence, extremely high numbers of registrations, many (if not most) of which may not result in calls being placed or received.

25. The request for and transmission of the customer profile occurs automatically whether or not a roaming cellular customer places or receives a call while in the foreign system. Indeed, the cellular customer is unaware that the transmission of the customer profile from the home system to the foreign system is even occurring. The registration process takes place prior to any call being placed and is completely separate, technically, from the process of setting up circuits to deliver a call.

26. IS-41 does not mandate the type of circuit to be used to carry calls from the home MTSO to the foreign MTSO where the customer is located. Permissively then, after obtaining the routing alias from the foreign system, the home system can, via inter-carrier signaling, deliver the call and the routing alias to a customer's PIC, which then delivers the call using the routing alias to the foreign MTSO. IS-41 also makes it easier for a roaming customer to make calls in a foreign system using the PIC. With IS-41, the foreign system will learn the identity of the customer's PIC as part of the profile information.²

27. Since equal access obligations have not been imposed on the entire cellular industry, IS-41 was designed to support, but not to require, the use of the customer's PIC to carry calls to and from a mobile customer. However, IS-41 was not designed to enable administrative information regarding a roaming customer to be carried by that customer's PIC. The foreign system cannot send its initial query to the home system over the customer's PIC since part of the purpose of the query is to learn the identity of the PIC. Once a query is sent over a network selected by the foreign system, the response should be returned over the same network. A transaction ID is allocated by the network that transmits the query. If the answer were returned via a different network, it would not be practical to correlate the query and response transactions. Consistency in the transmission path is therefore important to the speed and efficiency of the registration process. And that consistency should be maintained for the duration of the transaction. The fast and efficient exchange of information contemplated by IS-41 simply will not occur if the home MTSO's response to the foreign network's query must be returned over a separate network provided by the customer's PIC.

2. IS-41 will also help to eliminate fraud, which has become a grave problem in the industry. Like a credit card, a cellular telephone has to be validated to prevent illicit use. This process is complicated by the widespread use of "tumbler phones," so called for their ability to tumble illicitly through the electronic serial numbers (ESNs) until they find one that allows the cellular telephone to go on the air. Previously, the foreign system had no way to collect information about the bona fides of a particular ESN and the creditworthiness of a roaming subscriber. IS-41 will provide such information as part of the customer profile.

28. Like intersystem handoff, call delivery is a very sophisticated engineering feat. Trying to route administrative information via the customer's PIC may add an extra layer of complexity that would make no sense from a purely engineering point of view. Accordingly, IS-41 was designed to have this administrative information go over a special data network connecting the various MTSOs with each other, and consequently does not provide for use of the customer's PIC in the registration process.

John A. Marimb

4/17/91

Neil C. Fitzpatrick

5/1/92

Addendum B

AFFIDAVIT OF JOHN A. MARINHO

John A. Marinho, being duly sworn, deposes and says:

1. I am currently chairman of the TR 45.2 Subcommittee of the Telecommunications Industry Association. I submitted an affidavit in connection with the request of the Department of Justice for comments on the status of equal access technology for intersystem handoff. I submit this affidavit to clarify the status of certain issues raised in a May 10, 1991 letter to the Department of Justice from MCI Communications Corporation ("MCI") concerning the deliberations of the TR 45.2 Subcommittee.

2. The TR 45.2 Subcommittee has to date considered all contributions on equal access for intersystem handoff. Those written contributions referenced by MCI presented certain equal access proposals for exploration by the Subcommittee; they did not advocate adopting the options discussed. During its March 11, 1991 meeting, the Subcommittee decided without objection to table consideration of equal access in the handoff context, which based upon deliberations at that and previous meetings would appear to give rise to a very inefficient network design, and to proceed to other standards issues that the group needed to address. At this time, no further consideration of this issue is planned.


John A. Marinho

Sworn to and subscribed to before me this 17th day
of MAY, 1991


Notary Public

DONNA MASTRANTONIO
A NOTARY PUBLIC OF NEW JERSEY
My Commission Expires Oct. 4, 1994

Addendum C

AFFIDAVIT OF JOHN A. MARINHO

John A. Marinho, being duly sworn, deposes and says:

1. I am currently chairman of the TR 45.2 Subcommittee of the Telecommunications Industry Association ("TIA") and have held this position since 1989. Among its many other functions, TIA is actively involved in setting standards for a wide variety of telecommunications products.

2. Last year, I submitted two affidavits (attached hereto as Addenda A and B) in connection with the request of the Department of Justice for comments on the status of equal access technology for intersystem handoff. I submit this affidavit to update the information provided in the two affidavits submitted last year. As with my prior two affidavits, in discussing these matters in this affidavit, I am reporting the consensus of the members of the Subcommittee, as I understand it, and not necessarily my personal views or those of my employer.

3. Since last year, nothing has changed to alter the conclusion set forth in my initial affidavit that IS-41 was not designed for use of the customer's PIC in the intersystem handoff of a call from one MTSO to another because, though technically possible, it would result in a very inefficient network design at this time. Addendum A, ¶¶ 16-18. The issue of equal access in the handoff context was on the Subcommittee's agenda for several successive monthly meetings during the latter half of 1991. Because no member of the Subcommittee advocated adopting any of the equal access proposals explored by the Subcommittee, the issue was deferred each time. Finally, at the January 1992 meeting, the Subcommittee removed the issue from the agenda because no practical proposal for implementing equal access in the intersystem handoff context was before the Subcommittee. At that meeting, I stated that the Subcommittee would consider any future contributions brought to it on the issue. Since that time, no suggestions regarding equal access in the handoff context have been brought to the Subcommittee's attention.


John A. Marinho

Sworn to and subscribed before me this 6 day
of July, 1992.


Notary Public

MARGARET CARDOSO
NOTARY PUBLIC OF NEW JERSEY
My Commission Expires Dec. 20, 1993

CERTIFICATE OF SERVICE

I, Austin C. Schlick, hereby certify that on this 26th day of October, 1995 copies of the Request of the Bell Companies for an Interpretive Letter or, in the Alternative, a Waiver to Allow Interlata Handoff of PCS Calls were served upon the parties listed on the attached service list by first-class mail, postage prepaid.


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